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ABSTRACT

Schemata based notions need not replace, but should be reflected in, product-centered reading tests. The contributions of schema theory to the psycholinguistic model of reading has been thoroughly reviewed. Schemata-based reading tests provide several advantages: (1) they engage the appropriate conceptual processes for the student which frees the student from the decoding task at hand, making the tests more comfortable for the students and more valid for the evaluator; (2) they ensure that students' grades correlate closely with their understanding of the basic structure of a text; (3) they would be in harmony with the psycholinguistic model of processing; and (4) they would use authentic academic texts, which are usually longer than the paragraph or page of existing tests, as the basis of course-leaving examinations. Five basic text structures have been the focus of the schemata literature: collection, descriptions, comparison/contrast, causation, and problem/solution. Many academic texts combine causation and problem/solution. Traditional test questions for such a text would not be weighted in relation to prominence in rhetorical structure. Such questions might include discrete-point questions or questions based on a holistic approach (based on a typographical unit, not on the structure of a text). Proposed schema-based questions on this type of academic text would explicitly address the problem, its causes and effects, a solution, and evaluation of the solution. Examples of specific types of test questions based on a sample text (discussing global food insecurity) are included; the sample text is attached. (RS)

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Beverly A. Lewin

# A Schema-Based Reading Test

The contribution of schema theory to the psycho-linguistic model of reading has been thoroughly reviewed (Connor, 1984; Carrell, 1984; Carrell and Eisterhold, 1983). Briefly, a schema (plural: Schemata) is a systemization of background knowledge and cultural expectations at the rhetorical and content levels which provide memory with a structure in which to categorize, store, and later, retrieve, new information. It is now accepted that a schema or a "preconception" is essential to processing a text; otherwise, a reader may successfully decode a text at the lexical, syntactic, and rhetorical levels and still not understand what the text is "about" as the classic "laundry" text demonstrates (Bransford and Johnson, 1973).

While this theory was postulated from work on reading comprehension in the native language, later research has extended its findings to reading in a second language. Since rhetorical schemata are culturally specific, they must be systematically taught to the student of English as a Second Language (ESL). Carrell (1985) demonstrated that "training on the top-level rhetorical organization of expository texts significantly increased the amount of information that 25 ESL students would recall." Furthermore, since schemata are also discipline specific (e.g. sociology in contrast to chemistry) they are especially important in English for Academic Purposes (EAP) or English for Specific Purposes (ESP).

In addition to the rhetorical schema of a text, research has validated the concept of an "idea hierarchy" (i.e., content based). Meyer (1975) shows that "information located high or at the top levels in the hierarchical structure" namely, superordinate, or what teachers usually refer to as "main ideas", is recalled better than information at lower levels. This has been replicated with ESL students (Connor, 1984).

While the importance of schema theory to ESL instruction seems to have been amply and aptly demonstrated, the relevance to models of testing reading comprehension has yet to be asserted. Two considerations are in order. First, these remarks are confined to "product" oriented tests, where global understanding is the focus. Second, within "product" testing, holistic questioning, while more congruent with schema theory than is discrete point testing, does not automatically incorporate the schema of the text. In short, the holistic approach requires integration of textual units while the schematic is based on the idea structure of the text. This means that prominent ideas may be implicit or explicit, may or may not be signaled and may or may not coincide with the linear order of ideas. In addition, in authentic texts, hierarchy position is not always correlated with the "amount" of textual space devoted to it.

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Schemata based notions need not replace, but should be reflected in currently used product centered tests. Such test would have several advantages:

1. They would engage the appropriate conceptual processes for the student, freeing him or her for the decoding task at hand. Providing the rhetorical schema would allow students to focus on the content. This is supported by Carrel's research (1984) in which ESL readers who recognized the text's original discourse type and utilized this type to organize their own recall were able to reproduce more information from the original text. In addition, since L1 schemata for text organization may differ sharply from those in English, providing the schema for the ESL student would reduce one element of the cultural bias of reading tests.

2. Since recall, after instruction, conforms to the idea structure rather than the linear, tests would be in harmony with the psycholinguistic model of processing. This should make them more comfortable for the student and more valid for the evaluator.

3. It would ensure that a student's grade correlates closely with her/his understanding of the basic structure of a text. That proportion of points, e.g., 60%, which represents the "passing" grade would be allotted to main ideas. A student who understood only isolated details could not pass, in contrast to the situation today. (See Hanania and Shikhani, 1986, for an elaboration of this point).

4. The goals of the university English course would meet the needs of some university content-areas courses, in which students are asked to state an author's main ideas, criticize a hypothesis, etc., rather than perform the tasks currently demanded of them in ESP courses on reading comprehension tests. (See below for examples).

5. Authentic academic texts, which are usually longer than the paragraph or page currently used for testing, could be the basis of the course-leaving examination.

**Text types**

Five basic text structures have bee the focus of the schemata literature (Carrell, 1984) based on Meyer and Freedle (1984). These basic types are:

1. collection-"a grouping of listing of concepts or ideas by association.." e.g., definitions in a textbook, or, in more organized form, a historical chronology;
2. descriptions, in which the collection of attributes relates to the topic, e.g. a news article;
   These last two forms can be combined in the "collection of descriptions" form, e.g., "Several aspects of (topic) will be discussed. First...."
3. comparison/contrast;
4. causation, composed of antecedent and consequent
5. problem/solution.

These analyses have concentrated on very short units, usually less than one page, whereas authentic texts are much longer. Moreover, academic texts often contain more than one pattern, in a serial or recursive form. For instance, the text presented below, reflects types 4 and 5, causation and problem/solution (as do many academic texts). (Comparison, the third type cited in the research, is a sub-schema in the example provided). In the following typology, I have incorporated a more detailed analysis of type 5 texts by Hoey (1983) who sees the problem/solution text as basic to many discourse genres, including narratives.

Causation and Problem-Solution Models Combined
a. Situation or background
b. Problem (or in Hoey's phrase, "aspect of the situation requiring a response")
c. Antecedents or causes of problem
d. Effects or consequences of problem
e. Solution or response
f. Evaluation of solution
    a) by proposer of solution
    b) by author

Schema of "Global Food Insecurity" (See appendix for full text)
I. Problem (not enough food for poor countries)
    A. Antecedent
        1. Primary: affluence
        2. Secondary: doubling meat consumption (entails: increased use grain)
    B. Consequence (=new problem: malnutrition)
        1. Antecedents
        insufficient calories; insufficient protein
        2. Consequences
        brain size reduced, life span shortened, etc.

II. Solution
    A-D: Bringing unused agricultural land into production; etc.
    E: Agricultural technology
        1. Irrigation, etc.
        2. Water Control-comparison
            a)China
            b)India

III. Evaluation
    Positive-see paragraph D
    A. General (optimists assert, etc.)
    B. Specific
        Proposal 1-50% increase in usefully cultivatable areas, worldwide.
        Proposal 4-would save 10-20% of all crops
        Proposal 5-could increase yields, etc.

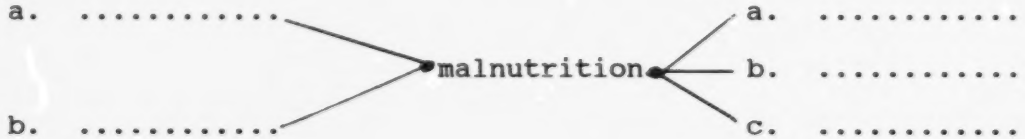
**Test questions**
**Traditional Questions** (items not weighted in relation to prominence in rhetorical structure; reflects linear sequence rather than rhetorical structure):

A. Discrete-Point Questions
   1. Why has the demand for food increased in the world today? (10 points)
   2. What percentage of products grown in North America goes to other relatively prosperous countries? (10 points)
   3. How has China helped to solve her food problem?
(10 points)

B. Holistic Approach: (based on typographical unit, such as the paragraph, not the structure of text)
   1. The main idea of paragraph A is:
      a. There are too many people in the world to feed
      b. Americans waste food
      c. The demand for animal protein is making the food crisis worse.
      d. Economic prosperity indirectly causes the world's food crisis.
(10 points)
   2. The main idea of paragraph B is:
      a. There is not enough food for poor countries because the U.S. overproduces.
      b. Food is being distributed unequally.
      c. Famine is increasing in poor countries.
      d. Poor countries don't have enough food because they don't have modern farming methods.
(10 points)

**Proposed Schema based questions:**
(Note: the manner of recovery of the material-form of question, type of task, etc.,-is subject to independent considerations and will not be discussed here. Secondly, teachers may have valid reasons for adjusting point allocation in accordance with author's emphasis, etc. Furthermore, communicative and critical questions can be added, in keeping with curriculum objectives).

A. (Problem) (40 points)
   1. What is the main problem discussed in this article? (10 points)
(causes)
   2. This problem is worse today because of .....which leads to ..... (15 points)
(effects)
   3. Complete the following cause-and-effect chain, according to paragraph C:




(10 points)

B. (Solution) (40 points)
   1. Which solutions involve a change in farming methods?
      Which solutions involve a change in consumer habits?
      Which solutions involve use of biotechnology?
      (etc.)
(34 points)
   2. Fill in the following table using the examples of India and China in lines 90-96:

**Attitude toward water control** **Effect on food production**

China_____

India_____
(6 points)

C. (Evaluation) (20 points)
Which of the following two statements represents the view of the author?
1. As world population continues to grow, we can only expect the food crisis to get worse.
2. Even if world population continues to grow, there is hope for feeding these people properly.
Defend your answer briefly by referring to:
a. the organization of the text
b. facts given in the text

**Appendix**

A.

Particular problem directly related to continuing population growth is growing global food insecurity. For a variety of reasons the demand for food by the consumer has begun to outrun the capacity to provide. Where all attention was previously focused on population growth as the sole source of demand on available food stocks, today an equally important source of demand has become apparent and that is affluence. As per capita income increases, purchasing power climbs and with it a demand for higher quality foods, especially foods of animal origin such as meat, eggs, milk, and milk products. Eating meat can be considered an inefficient way of utilizing grain. In the United States it takes three pounds of grain to produce a pound of poultry; 5:1 is the ratio for pork and 10:1 for beef. In the end, Americans eat eighty percent of all the grain they consume indirectly, first using it for feed and then consuming the meat. On the basis of these data, Americans consume the equivalent of one ton of grain a year while inhabitants of poorer countries consume one fifth as much. Outside our borders, other nations with growing economies but without comparable agriculture have also increased their appetites for animal protein. Hence, sixty percent of North American agricultural sales has been to nations whose people are already rather well fed. At this time, the approximately one billion people of the developed world feed enough grain to their livestock and poultry to provide minimal nutritional requirements to another 2 billion people. Over the last twenty years, the rich minority of the world has doubled its meat consumption. This is, however, not due to eating twice as much meat per capita, although there has been some rise here. Rather, there are twice as many people with the money to buy a higher quality protein-rich diet. The net result is that while world population has been growing at 1.6 percent and agricultural production at 2.5 percent, world demand for food has been increasing at 3 percent per year.

B.

It is to our advantage and the world's as well that the United States grain harvests in the years 1975-1977 have resulted in bumper yields. Overflowing granaries and low grain prices are the mark of this high productivity. But

the great increases in food production have not occurred where populations are growing the fastest. Gains in production require modern energy-intensive methods combining irrigation, pesticides, herbicides, fertilizers, genetics, and mechanization. One reason, among several, why poor countries have lagged behind in food production is because their farmers have not had access to appropriate technologies, such as sufficient fertilizers, irrigation, improved seeds, pesticides, storage facilities, and transportation. The world's poor are thus driven to world food markets to supplement their needs. However, they must compete there with richer nations whose own increased demands have forced the price of grain upward. Caught in the price squeeze of competition in which rising food prices outstrip purchasing power, the poor countries can buy less and less with their precious dollars. So today, we have the producer nations with surpluses to sell, the affluent consumer nations who have money to buy, and the low income consumer countries that cannot effectively compete in the world food markets.

C.
World hunger is sustained by scarcity promoted by the economic system of rich countries. According to some estimates, world agriculture could produce enough to feed up to 30 billion people. What appears to be a food shortage may, in fact, be an uneven world-wide distribution of economic power. These differentials represent an ever growing number of hungry people. The result is famine in some parts of the world, most notably on the Indian subcontinent and some countries in Africa, Latin America, and South America, and an over-abundance of food in a number of others.

D.
But along with this there is also a less visible crisis emerging, the silent crisis of malnutrition, which is denying close to an estimated billion human beings the "basic right to realize their full genetic potential, their full humanity." It is believed the twenty percent of all the people in developing countries-350 to 450 million people--are undernourished due to insufficient caloric intake; kwashiorkor, a disease brought on by insufficient protein but adequate calories, is found in 1 to 10 percent of preschool age children in less-developed countries in less-developed countries; marasmus, a protein plus calorie malnutrition disease, has a frequency of 1.2 to 8 percent in preschool age children in low income countries.

E.
The effects of malnutrition are farreaching. During infancy, brain size can be reduced and a permanent deficiency in intelligence can result. Physical size and vigor is diminished. Life span may be shortened. Certain nutritional deficiencies can cause specific diseases, such as blindness caused by lack of Vitamin A or anemia by a shortage of iron....

F.
If "nothing will work but food," what is the potential for increasing the world food supply? Optimists assert that the earth can easily support a population several times larger than the present one. The future-oriented Hudson Institute calculates that, based on present technology alone, there is enough arable land, food, and resources to support 15 to 20 billion people with an average per capita income of $20,000. According to some

estimates, the number of people who could be fed can be increased tenfold by taking the following measures:

1. Bringing marginal or hitherto unused agricultural land into production. One-half to one-third of the total cultivated land is left fallow or used as meadowland; chemical fertilizers, irrigation in some areas, drainage control in others, could bring this land into production.
2. Shifting from nonessential to essential agricultural production. About ten percent of the agricultural land is used to grow nonfood crops such as cotton, tobacco, rubber, coffee, etc.
3. Simplifying diets from animal to plant protein; e.g., the wealthy minority of the world feeds as much grain to animals as the rest of the world eats;....
4. Better insect and pest control. Ten to twenty percent of all crops are destroyed in the field or in storage by pests of various kinds.
5. Increased agricultural technology. Irrigation, pesticides, fertilizers, applied genetics, and mechanization could increase yields in most areas of the world. Agricultural technology is thought to be the major way to increase production (both India and China faced famine in 1973, but China did not fear famine, for the past twenty years water control programs have had top priority there; 35 giant reservoirs have been built, rivers have been broadened, and thousands of wells have been dug. China, with 25 percent of the world's people, owns about eight percent of the world's arable land, yet significant hunger has been eliminated from the country. India, on the other hand, has tapped less than three percent of its water resources.

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